Graph Theory Final: Stuff to Know

1 General Info

- Exam will be in-class Friday June 28, in **DCC 308**
- Exam will be closed notes, closed book, closed neighbor
- **One** two-sided crib sheet is allowed (written or printed)
- Material will cover Chapters 1-7 of the book AND additional material and algorithms covered in class
- Material will more heavily focus on Chapter 5-7, but ALL material is fair game
- Know everything in the online notes that's in bold
- Questions will require direct knowledge of the definitions and graph properties we discussed, applying algorithms and knowledge to problems, and working through proofs.

The following material is only a guide. Regardless of what is listed below, everything discussed in class and in the online notes can appear on the test unless explicitly stated otherwise. This should be used in conjunction with the study guide for the midterm.

2 Chapter 5

1. Vertex coloring - basic definitions; chromatic number; greedy algorithm
2. Coloring bounds - all bounds we talked about; color-criticality; perfect graphs; Mycielskis Construction; Turán Graphs
3. Counting colorings - chromatic polynomial, general form and form for cliques and trees; recurrence relation using edge contraction
4. Chordal graphs - chords and chordless cycles; simplicial elimination ordering; relation to perfect graphs

3 Chapter 6

1. Graph planarity - basic definitions; crossings; drawings/embeddings; faces and lengths of faces; dual graphs; outerplanarity; maximal planar/minimal non-planar graphs; triangulations
2. Planarity conditions - Euler's formula and resultant inequalities; Kuratowski subgraphs and Kuratowski's Theorem (along with results of subproofs)
3. Coloring of planar graphs - four and five color theorems

4 Chapter 7

1. Line graphs - definition; relation between problems on G and problems on $L(G)$; conditions for the existence of H such that $G = L(H)$; forbidden subgraphs (don't need to know all of them specifically, but just the properties that they have)
2. Edge coloring - basic definitions; bounds; relation between vertex coloring of $L(G)$ and edge coloring of G
3. Hamiltonian cycles and paths - necessary conditions; sufficient conditions

5 Other

1. Complexity bounds and their relation to the problems discussed in class - you don't need to memorize them for every problem we talked about, but you do need to understand what's meant by e.g., "an exact algorithm for the maximum independent set problem on a general graph runs in exponential time"